

## CLAIMS

What is claimed is:

1. A method for removal of contaminants from a stream of hydride gas,  
comprising contacting a hydride gas stream with a material comprising a  
5 quantity of a lanthanide group metal oxide to reduce the level of  
contaminants of the gas stream to not more than about 100 parts per billion  
(ppb), the material being substantially unaffected by the gas.
2. The method of claim 1, wherein the lanthanide metal is selected from the  
group consisting of (La), cerium (Ce), praseodymium (Pr), neodymium (Nd),  
10 promethium (Pm), samarium (Sm), europium (Eu), gadolinium (Gd), terbium  
(Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm) and  
ytterbium (Yb).
3. The method of claim 1, wherein the lanthanide metal is selected from the  
group consisting of La, Ce and Sm.
- 15 4. The method of claim 1, wherein the material further comprises a highly  
electropositive metal or highly electropositive metal oxide.
5. The method of claim 1, wherein the material further comprises a rare earth  
metal selected from the group consisting of scandium (Sc), yttrium (Y) and  
lutetium (Lu), a lanthanide metal or oxide thereof, or a combination thereof.
- 20 6. The method of claim 1, wherein the material further comprises at least one  
transition metal or oxide thereof.

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7. The method of claim 6, wherein the transition metal is selected from the group consisting of manganese, chromium, molybdenum, vanadium, titanium and zirconium.
8. The method of claim 1, wherein the material is supported on a support  
5 substrate.
9. The method of claim 1, wherein the material has a surface area of less than about 100 m<sup>2</sup>/g.
10. The method of claim 1, wherein the material has a surface area of less than about 75 m<sup>2</sup>/g.
- 10 11. The method of claim 1, wherein the material has a surface area of less than about 50 m<sup>2</sup>/g.
12. The method of claim 1, wherein the material has a surface area of less than about 20 m<sup>2</sup>/g.
13. The method of claim 1, wherein the material has a capacity for oxygen that is  
15 at least about 4 liters of oxygen per liter of material at 25°C and 15 psig.
14. The method of claim 13, wherein the material further has a capacity for water vapor that is at least about 4 liters of water vapor per liter of material at 25°C and 15 psig.
15. The method of claim 1, wherein the hydride gas is selected from the group  
20 consisting of ammonia, arsine, phosphine, diborane, disilane, germane, silane and hydrogen.

16. The method of claim 1, wherein one or more of the contaminants are selected from the group consisting of water, carbon dioxide, oxygen, non-methane hydrocarbons, hydride gas oxidation products, secondary hydride gas contaminants,  $\text{SO}_x$  and  $\text{NO}_x$ , wherein x is 1-3.
- 5 17. The method of claim 16, wherein one or more of the contaminants are selected from the group consisting of water, oxygen and a combination thereof.
18. The method of claim 1, wherein one or more of the contaminants are volatile metal compounds.
- 10 19. The method of claim 1, wherein one or more of the contaminants are metal-containing compounds.
20. A composition for the purification of hydride gases, comprising 3-20% by weight of a lanthanide group oxide, wherein the composition is essentially free of at least one of copper, iron or nickel.
- 15 21. The composition of claim 20, wherein the composition further comprises manganese oxide.